1942

April, 1942 Circular 434

BROWN ROT OF PEACH
and
Its Control

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Decayed Peaches Still Moist But Covered With Spores

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- SEP 1944

BROWN ROT OF PEACH
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Brown rot, a fungus disease of stone fruits, is known in practically all countries of the world where susceptible plants are grown, but its importance is limited by climatic factors. In arid or relatively dry regions, or in regions that experience very high summer temperatures, brown rot is absent or rare. In humid sections that experience only moderate summer temperatures, however, brown rot may become extremely destructive.

Blossom and Twig Cankers

Although brown rot is most abundant on the blossoms and maturing fruit, it also affects peach twigs and leaves. Of these, the blossoms are usually the first to become infected in the spring. All portions of the blossom are very susceptible to brown rot. This being true, infection through one or more of the floral parts may take place from an early pink bud stage until after the shucks have fallen.

Twig cankers are frequently formed as the result of the fungus passing from the floral parts through the pedicel into the tissues of the twig. Such cankers are also occasionally formed as the result of the fungus growing from diseased fruits through the stem into the twig. Such cankers occasionally girdle and kill the twigs, but more often small cankers, about an inch in length, are formed with the base of the floral or fruit pedicel as their centers. The fungus remains alive in these twig cankers and diseased floral parts for some time after infection takes place, and from these locations, numerous spores may be produced during periods of warm moist weather. Although infected blossoms serve as a source of infection for the current season, twig cankers may be active infection centers for as much as a year.

Fruit Rot

Brown rot of peach is essentially a rot of the maturing fruit, although the fungus may enter green peaches through punctures or bruises. Spores of the fungus are carried to the maturing fruits from last year's and current year's fruit mummies, blighted blossoms, twig cankers, diseased leaves, and from other diseased fruits. On the fruit the organism causes brown,

decayed areas which rapidly increase in size. Within a few days grayish tufts composed of the fruiting structures of the casual fungus develop on the surface, giving the spots a moldy, ashen appearance. This lesion increases in size until the entire fruit is completely decayed. Later these decayed fruits shrink to a grayish or black mummy which may remain on the tree throughout the winter.

Role of Peach Mummies

In addition to the twig cankers which have been discussed, peach mummies constitute one of the major locations where the fungus survives the winter. The mummies that fall to the ground have been reported by investigators to be extremely resistant to decomposition. In Michigan they have been reported to withstand decomposition for as much as ten years; in Georgia, where conditions favor rapid decomposition of organic matter, buried peach mummies have resisted decomposition and produced successive crops of spores each year for a period of six years. Just how long such mummies may resist decomposition in New Jersey has not been determined. Probably the length of this period would be shortened by cultivation and high fertility.

Undecomposed mummies, when conditions are favorable, produce small, frail, brown, morning glory-shaped growths called apothecia, in the spring, about the time when the peach fruit buds show pink. On the upper surface of these growths numerous spores are produced which are expelled during wet periods, and which, if they fall on an unprotected floral part, are capable of re-establishing the brown rot fungus in the orchard. Although the mummies on the ground are extremely important in some areas in re-establishing the fungus in the orchard, they seem to be important in New Jersey (especially North Jersey) only during an occasional spring, since apothecia do not seem to be formed every year.

The peach mummies that remain hanging on the trees do not produce apothecia, but instead they produce numerous summer spores beginning in the early spring. This source of inoculum for early spring infections is probably the most constant single source in New Jersey as such mummies can be counted on to produce spores each year. This being true, such mummies should be removed from the trees some time during the fall or winter months.

General Considerations

The fungus responsible for brown rot is favored by temperatures ranging between 75 and 80 degrees Fahrenheit and is eliminated as an active peach parasite at temperatures of 90 degrees Fahrenheit or over. Not only is the activity of the brown rot producing fungus greatly influenced by the

atmospheric temperature, but by the presence or absence of moisture as well. Spores of the fungus, in order to produce the disease, require the presence of moisture films for a sufficient period of time to allow for both germination and infection to take place. For this reason, sites for peach orchards should be selected that have good air drainage, allowing maximum opportunities for rapid drying following showers and heavy dews. Poor air circulation, caused by closely planted trees, over vegetative trees or high weeds should be avoided. It is also almost impossible to spray or dust adequately the closely planted trees whose branches have become interlocked.

Frequent rains and high humidity, besides supplying the moisture films which are necessary for the initiation of brown rot, favor the development of peaches which are larger and more watery than normal. Such fruits are unusually susceptible to brown rot. During years of high precipitation, especially where such periods of high moisture follow a dry period, large and small cracks are often produced in the skins of maturing fruits. Such injuries furnish ideal locations for brown rot to start. Varieties that crack freely under such circumstances, will thereby be rendered unusually susceptible to this disease. If peach scab is severe enough to cause skin cracking it will also adversely affect susceptibility.

Relation of Insect Injury to Brown Rot

Many investigators have shown that infection can take place, in ripe fruits, through the uninjured epidermis, but that infection takes place more easily and is more common when the surface is bruised or punctured. In experiments conducted jointly by the Bureau of Entomology and Plant Industry of the U. S. Department of Agriculture, it has been found that in most years about 90 per cent of the brown rot infections occurring in peach orchards take place through insect punctures, chiefly those caused by curculio and the oriental fruit moth. In some orchards Japanese beetles may become quite an important factor in increasing brown rot infection.

Susceptible Varieties

Peaches which are normally firm but have become soft and watery due to unfavorable weather, are more easily infected than are the more solid ones. Also, some varieties are more susceptible to the rot than are others. The J. H. Hale, White Hale, Champion, Red Bird, Rochester and others are known to be unusually regular and severe sufferers from brown rot. Because of the introduction of a large number of new varieties of peaches into the state in recent years, it might be wise for a grower to investigate the brown rot record of a variety in his community before setting it out in a planting.

Where unusually susceptible varieties are grown extreme precautions

should be taken in the entire control program. If adequate control measures are not followed carefully, brown rot may cause the destruction of a considerable portion of the crop; and since the spores of the organism are produced abundantly on diseased fruits, these varieties may prove to be a menace to nearby peaches—especially those varieties that mature at the same time or at a later date.

Control

The suggestions for the control of brown rot fall into three general groups, namely, sound horticultural practices, sanitation, and control by the use of fungicides. The first two approaches to the problem will not in themselves control brown rot, but rather they constitute supplementary measures which make control by spraying and dusting more nearly complete or readily accomplished.

Sound Horticultural Practices — The purpose of the control measures considered in this group are not meant to affect the brown rot fungus directly, but rather to affect or select the environment and the peach itself, in such a way as to diminish the likelihood of the occurrence of the disease.

Environmental factors which make for slow drying of moist surfaces favor brown rot and so should be avoided. Sites with poor air drainage, overcrowded and over vegetative trees, and high weeds in an orchard should be shunned. Over vegetative trees should likewise be avoided since they produce large, unusually susceptible peaches.

Because insect injuries are so important as locations for brown rot infection, every effort should be made to reduce insect injuries to the peaches, especially those of the plum curculio, oriental fruit moth, and in some cases the Japanese beetle.

Sanitation—The purpose of adopting sanitary measures is to hold the inoculum at as low a level as is possible at all times.

Mummies hanging on the tree produce brown rot spores every spring and therefore constitute an annual menace to the peach crop. Mummies lying on the ground do not produce spores every year and consequently do not supply an annual threat to the peach crop. For this reason, it is felt that mummies hanging on the tree should either be removed from the orchard, or at least knocked to the ground, some time during the fall or early winter months.

Although removing the mummies on the ground from the orchard would be a sound practice, it is doubtful whether this would be commercially profitable. It has been demonstrated, however, that when such mummies are disturbed at the time of apothecial production, the spores are never formed. Because of this it is felt that a harrowing or discing of the orchard during

the pink bud stage would be worth while, particularly where brown rot was severe the previous year.

Pickers should be instructed not to touch, if possible, peaches that are affected with brown rot, as such peaches usually bear many spores which become attached to the hands and in this manner are then carried by them to healthy fruits.

SPRAYING AND DUSTING—The purpose of spraying or dusting peach trees for brown rot control is to cover the susceptible plant parts with a fungicide that will protect them against infections from the fungus spores that chance to become lodged there. Sulfur is the most satisfactory material for this purpose.

Sprays applied during the dormant season, even though they may be several times stronger than is required to kill brown rot spores, have no noticeable effect in controlling brown rot, except as they aid in the control of leaf curl. Rudolph, from California, reports that neither lime sulfur 1-10 nor bordeaux mixture 10-10-100 when used as a dormant spray, was of any practical value in preventing blossom infections of apricots. Manns and Adams (Delaware) found that, from twig cankers on dormant peach twigs that had been dipped in a strong bordeaux mixture and dried, the fungus produced abundant spores which pushed out through the fungicide.

An application of lime sulfur 1-50 at the pink bud stage has long been recommended as a control for the blossom blight phase of brown rot. Experiments conducted have also shown that under some conditions, a wettable sulfur spray in the bloom is of value. Although both pre-bloom and bloom sprays are undoubtedly of value in some years, it is doubtful if the general application of these two sprays would be practical. In fact, one cannot guarantee that the pre-bloom spray alone will always be worth the expense and bother involved in applying it. However, it is felt that until more effective measures are discovered to reduce the winter carry over of the brown rot fungus, the pink bud spray should stand as recommended.

Inasmuch as most effective control of brown rot requires that the fungicide not only be applied thoroughly and on time, but also that the protecting material remain on the sprayed surface for a reasonable length of time, it is advised that only wet sprays be used during pre-bloom and shuck-split applications. This recommendation is made because the floral organs are smooth and not conducive to good dust adherence.

Although the application of sulfur, in combination with an insecticide, to green fruit is of value directly in preventing brown rot, its chief benefit comes from the prevention of skin ruptures, caused by insects and peach scab, through which brown rot may enter. As has been pointed out, peaches whose skins have been injured by insects, cracked by scab, or bruised by hail or other agencies are thereby rendered unusually susceptible to this disease. In fact the number of green peaches which become infected, except

through a break in the skin, are few indeed. Such diseased fruits not only constitute a reduction in the set, but they form an additional source of spores that may infect other fruit later in the season. For this reason all cover sprays, including the shuck split application, are important in the brown rot control program.

Because of the increased susceptibility of the fruit to brown rot during the period of rapid softening, it is extremely important that the fruit be kept covered with a film of sulfur during that time. This can be done by the use of one or more applications of a sulfur dust. Such applications can be made right up to harvest.

To avoid undue staining, where the fungicide is applied as a wet spray, only the sulfurs which do not carry a high percentage of inerts should be used during a month or 6-week period just preceding harvest. Where the sulfur used is not mixed with an inert material a wet spray may be used safely as late as ten days to two weeks before harvest.

The adoption of these measures will not guarantee a crop free from brown rot, nor will it even insure that a sizeable fraction of the crop will not be ruined by the disease in periods when the weather is very favorable for brown rot. Regardless of the nature of the season, however, the adoption of a sound brown rot control program is a necessity if a satisfactory commercial crop is to be produced.